REMARKS

Claims 1-13 are currently pending in this application. Claims 1, 4, 14, 15, 24, and 25 are currently amended to clarify the recited formulas. Support for the amendments can be found throughout the specification and claims as originally filed, for example at page 8 lines 31-32; page 20 lines 23-32; page 22, line 25 to page 23, line 1; and page 25, lines 1-10 (corresponding to paragraphs [0038], [0110], [0118], and [0133]). No new matter is added.

Claims 1-13 stand rejected under 35 U.S.C. § 103 as unpatentable over Ohashi ("Improved CIGS thin-film solar cells by surface sulfurization using In_2S_3 and sulfur vapor").

Applicant submits that the Examiner has not met his burden to show that any of the alloys or portions of alloys of Ohashi would inherently possess the recited x-ray diffraction properties. As discussed in greater detail below, the CIGS, CIGSS, and CIGS/CIGSS and any portions of the alloys disclosed in Ohashi are ***heterogeneous not homogenous*** (see Fig 1(a) and 3(b)). As explained in detail below, a heterogeneous film ***cannot*** produce the recited x-ray diffraction properties.

Legal Standard for Inherency

Applicants note that "[i]nherency, however, may not be established by probabilities or possibilities. The fact that a given thing ***may*** result from a given set of circumstances is not sufficient." *In re* Oelrich, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981). *See also* Tintec Industries, Inc. v. Top-USA Corp., 63 U.S.P.Q.2d 1597, 1599 (Fed. Cir. 2002). When relying upon the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic ***necessarily flows*** from the teachings of the applied prior art. *Ex parte* Levy, 17 U.S.P.Q.2d. 1461, 1464 (Bd. Pat. App. & Inter. 1990)(emphasis added).

Claim 1 recites an "x ray diffraction pattern (GIXRD) for a glancing angle of from 0.2° to 10°". The Examiner has clearly not met his burden for proving that the alloys in Ohashi necessarily have the recited x-ray data.

The x-ray patterns of Ohashi only disclose measurements at 0.1°, 1° and 10°. Ohashi fails to disclose or report results for any other angles within the recited range. This does not teach or suggest that the recited range of 0.2° to 10° will have the claimed diffraction pattern.

Further, as explained previously, the readings with an angle of 0.1° are less reliable due to the amount of noise present. The Examiner has failed to provide ***any*** technical reason that the alloys studied in Ohashi would result in x ray diffraction pattern (GIXRD) for a glancing angle of from 0.2° to 10° with an absolute shift in the $2\theta_{(112)}$ angle of less than 0.06°. The Examiner has provided ***no*** scientific reasoning to support the assertion that the rest of the range that was not measured by Ohashi would ***necessarily*** show an absolute shift in the $2\theta_{(112)}$ angle of less than 0.06°, as required for a showing of inherency. In contrast, as argued in detail and supported with published scientific results, Applicant has shown that heterogeneous alloys, such as those of Ohashi, ***cannot*** produce the recited x-ray diffraction properties.

The Examiner also found that assuming "arguendo the films [of Ohashi] are not homogenous, it is unclear how that would affect the recited properties." Final Office Action at page 4. Applicant discusses below, with specificity, why 1) The films of Ohashi are heterogeneous and 2) why this means they are not equivalent to the claimed alloys and thus do not have the same GIXRD shifts.

The Alloys of Ohashi are Heterogeneous

The AES depth profiles in Figs. 1(a) and 3(b) of Ohashi (shown below) reflect (i) the expected enrichment of the surface layer with sulfur and (ii) a systematic increase in the Ga concentration towards the Mo back contact, while the In concentration decreases in the same direction. The net result is a ***substantial*** variation in the Ga/In+Ga and S/Se+S atomic ratios through the film depth. Thus, the alloys of Ohashi are ***clearly not homogenous*** based on the results of the AES depth profiling show below. Figs. 1(a) and 3(b) of Ohashi show a consistent variation in the composition of the alloy versus depth. This is true for the surface CIGSS layer as well as the bulk CIGS material. Thus, any portion of the alloys formed and studied in Ohashi are heterogeneous and not homogenous due to the varying elemental composition versus depth of the material.

Fig. 1(a):

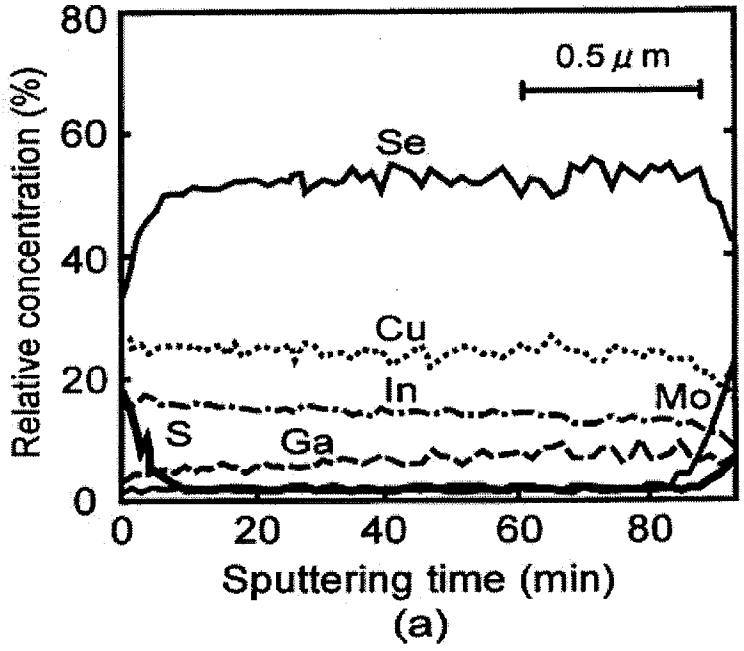
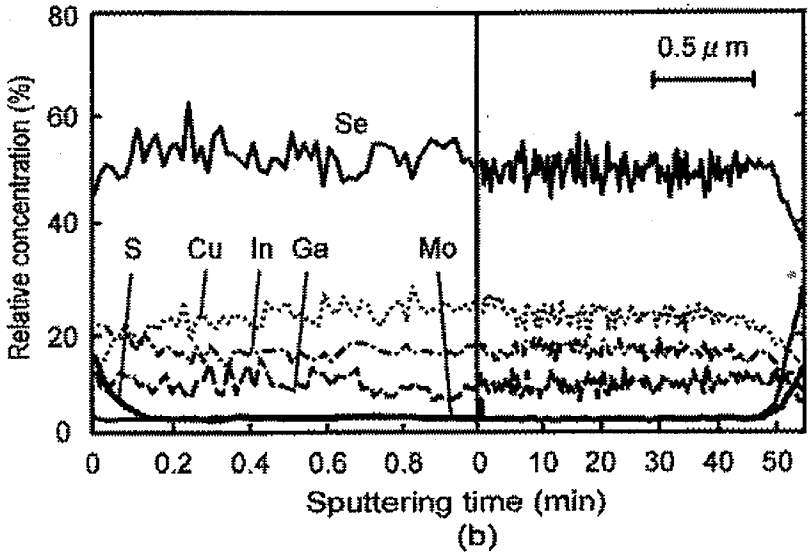


Fig. 3(b):



The lattice parameters of multinary alloys are controlled by the group III and group VI atomic ratios. Any significant change in the Ga/In+Ga and/or S/Se+S atomic ratios with sample depth would therefore result in a variation in the lattice parameters. The variation in elemental concentration (Cu, In, Ga, Se and S) with sample depth can be detected with AES, while the corresponding change in lattice parameters can be detected by GIXRD at a range of incidence angles.

There should be a direct correspondence between AES and GIXRD results. If AES measurements depict a substantial variation in the Ga/In+Ga and S/Se+S atomic ratios with sample depth, the corresponding GIXRD results should also reflect a substantial variation in lattice parameters.

The GIXRD incidence angle determines the penetration depth of the measurement. For example, in CIGS alloys incidence angles of 0.5°, 1°, 2°, 5°, and 10° correspond to penetration depths of about 150 nm, 300 nm, 600 nm, 1500 nm, and 3000 nm, respectively.

In the case of GIXRD, an accurate assessment of the variation in lattice parameters with sample depth can only be achieved if a plurality of angles is considered (for example, angles of 0.5°, 1°, 2°, 5° and 10° were used to analyze the films in the specification of this application).

Ohashi only discloses ***heterogeneous*** alloys because the compositions of the various constituent elements of the alloys vary with the depth of the alloy. For the reasons discussed below, a heterogeneous alloy ***cannot*** produce the recited x-ray diffraction properties.

Heterogeneous Alloys Cannot Produce the Recited GIXRD Shift

The films of Ohashi cannot produce the recited x-ray diffraction properties because: 1) the films are heterogeneous as the ratio of the elements in the film varies with the depth of the alloy resulting in a shift of the x-ray data greater than the recited range and 2) when compared to films produced by methods similar to Ohashi the films do not produce the recited x-ray data.

The results illustrated in Fig. 3(a) of Ohashi cannot be considered in isolation. All aspects of the results presented in Ohashi along with the technical understanding of the skilled artisan should be considered. The GIXRD data shown in Ohashi is not consistent with the AES results. Figs. 1(b) and 3(a) of Ohashi are not sufficient to establish the in-depth compositional features of the alloys because of the restricted number of incident angles that fail to reflect variations in compositions (and hence lattice parameters) revealed by the corresponding AES results depicted in Figs. 1(a) and 3(b) of Ohashi.

Fig. 1(a) of Ohashi shows that the Ga/In ratio varies continuously through the depth of the film. The Ga concentration decreases from about 10% at the Mo back contact to about 0% at the near-surface region of the film, while the In concentration continuously increases towards the surface of the CIGS film. The estimated net effect is a variation of about 25% in the Ga/In+Ga

atomic ratio. The variations in the Ga/In+Ga atomic ratio of about 25% would result in a shift of at least 0.25° in the GIXRD angles of the particular CIGS-film. Thus, the results of Ohashi ***do not disclose the recited GIXRD*** properties for at least this reason.

To further support the deficiencies of the GIXRD data of the alloys of Ohashi, reference was made to an article entitled "A comparison of the material and device properties of homogeneous and compositional graded $Cu(In,Ga)(Se,S)_2$ chalcopyrite thin films". The compositional graded samples referred to in this article were prepared by a post-sulfurization method similar to that disclosed in Ohashi. The in-depth compositional properties of these samples were compared under identical GIXRD experimental conditions (radiation source, voltage, current and incident angles) with those of homogeneous CIGSSe films prepared according to the methods disclosed in Application Serial No. 10/568,227. As shown in Fig. 3(b), the properties of the graded CIGSS films were evaluated over a range of incidence angles between 0.2° and 10°. For incidence angles of 1° and 10° the peaks overlap and have values close to 26.8°, which correspond to the peaks in Fig. 1(a) of Ohashi. However, at small incidence angles between 0.2° and 0.5° (not disclosed in Ohashi) the position of the [112] peak shifted to higher values between 27 and 27.2°, which is expected due to the replacement of Se with S in the near-surface region of the samples.

Accordingly, in view of the AES depth profiles in Ohashi and the data in Fig. 3(b) of the reference provided in the previous response one skilled in the art would conclude that the ***heterogeneous*** alloys of Ohashi ***do not*** explicitly or inherently disclose an alloy with "a glancing incidence x ray diffraction pattern (GIXRD) for a glancing angle of from 0.2° to 10° reflects an absolute shift in the $2\theta_{(112)}$ angle of less than 0.06°" as claimed. Therefore, Applicant respectfully requests withdrawal of this rejection for at least this reason.

In conclusion, the Examiner has not provided a sufficient basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic ***necessarily flows*** from the teachings of the applied prior art. *Ex parte* Levy, 17 U.S.P.Q.2d. 1461, 1464 (Bd. Pat. App. & Inter. 1990)(emphasis added).

Accordingly, the skilled artisan would appreciate that a heterogeneous alloy is not capable of producing an "alloy being characterized by an x-ray diffraction pattern (XRD) having a main [112] peak at a 2θ angle ($2\theta_{(112)}$) of from 26° to 28° for Cu radiation at 40kV, wherein a glancing

incidence x ray diffraction pattern (GIXRD) for a glancing angle of from 0.2° to 10° reflects an absolute shift in the $2\theta_{(112)}$ angle of less than 0.06°" as recited in Claim 1. Thus, Ohashi fails to disclose the features of Claim 1 and its dependents. Accordingly, Applicant respectfully requests withdrawal of this rejection for at least this reason.

No reasonable expectation of success

Moreover, one skilled in the art would have no reasonable expectation of success for forming an alloy with the recited properties. *Pharmastem Therapeutics v. Viacell, Inc.* 491 F.3d 1342, 83 U.S.P.Q.2d 1289 (Fed. Cir. 2007) (after *KSR*, Federal Circuit finds claims non-obvious for lack of indication of reasonable expectation of success for asserted combination). Ohashi only discloses a two stage method for depositing the thin films. Ohashi fails to disclose how to overcome the problems known in the art with the two-stage process. There is no reason to deposit a film with the claimed features and no expectation of success to deposit a film with the claimed features by the methods disclosed in Ohashi. Further, the skilled artisan would have no reasonable expectation of success because the alloy formed in Ohashi is heterogeneous and would not be expected to produce the recited GIXRD pattern because of the heterogeneous composition and presence of multiple phases. Again, there is no teaching or suggestion in Ohashi for how to overcome the problems known in the art with the two-stage method to achieve a film with the recited properties.

Dependent Claims

The Examiner further found the features of Claims 6-13 to be inherent, relying on cases in which the claimed and prior art products were identical or substantially identical in structure or composition, or were produced by identical or substantially identical processes. As discussed above, in the present application the products are not produced by the same methods and the products are clearly different. Accordingly, Applicant submits that the caselaw is not applicable to the current facts and that the Examiner has not met his burden to show that the features of even Claim 1 must necessarily flow from the cited references, as required.

The cited references fail to disclose the features of the dependant claims. In particular, Ohashi fails to disclose or make obvious any of the recited variance in d-spacing values.

Applicant notes that Ohashi fails to disclose any d-spacing values, much less "wherein the alloy has a crystal structure comprising a lattice of unit cells, wherein all crystallographic planes of the unit cells show a variance in d-spacing of less than 0.01Å" or "wherein the alloy has a crystal structure comprising a lattice of unit cells, wherein all crystallographic planes of the unit cells show a variance in d-spacing of less than 0.001Å" as recited in Claims 2 and 8, respectively. Also, these features are not inherent as the Examiner has provided no basis for a finding that the features are necessarily present in the cited art and because the films are produced by different methods and would be different. There is no reason to modify the art to achieve the recited features or any expectation of success. Accordingly, Applicant request that the rejections of Claims 2 and 8 be withdrawn for at least this reason.

Ohashi also fails to teach the features of Claim 3. Claim 3 recites in part "wherein the element concentration of elements A, B, C, D, and E, as characterized by XPS depth profiling, is substantially uniform through the alloy".

The Examiner found that substantially uniform XPS depth profiling read on the depth profiling of the cited reference. Applicants respectfully disagree because, as discussed above, Ohashi clearly discloses compositional gradients throughout the entire film. This is shown in the AES profiles for the alloys in Figs. 1(a) and 3(b). Therefore Ohashi fail to disclose this feature. Accordingly, Applicant request that the rejections of Claim 3 be withdrawn for at least this reason.

Additionally, Applicant submits that Claims 4-7 and 9-13 also define over the cited references, not only because they depend from Claim 1 but also on their own merit.

Applicants also disagree with some of the Examiner's other findings. In the advisory action dated December 9, 2009, the Examiner maintained the rejections finding that "Applicants argument in page 6, last paragraph is noted. But, instant claims 1-5 do not require S. Furthermore, there is no processing limitation and specific elements recited in instant claim 1". Advisory action box 11. Applicant notes that, in contrast to the Examiner's finding, Claims 4 and 5 specifically recite S. Further, Applicant note that the pending claims do not need to recite any process limitations to distinguish Ohashi because, as discussed in detail above, the process of Ohashi cannot produce an alloy as recited in Claim 1.

Request for rejoinder

Applicant submits that the claims are in condition for allowance. Claim 1 is currently generic. Upon allowance of a generic claim, Applicant respectfully requests rejoinder of withdrawn Claims 14-37.

No Disclaimers or Disavowals

Although the present communication may include characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Co-Pending Applications of Assignee

Applicant wishes to draw the Examiner's attention to the following co-pending applications of the present application's assignee.

Docket No.	Serial No.	Title	Filed
DMKISCH.002APC	10/568,227	METHOD FOR THE PREPARATION OF GROUP IB-IIIA-VIA QUATERNARY OR HIGHER ALLOY SEMICONDUCTOR FILMS	May 17, 2006

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: December 21, 2009

By: _____

David K. Buckingham
Registration No. 60,695
Attorney of Record
Customer No. 20,995
(415) 954-4114

8280575 // 121709